DEPARTMENT OF PUBLIC SAFETY AND CORRECTIONS

Public Safety Services

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STATE FIRE MARSHAL

INTERPRETIVE MEMORANDUM 2000-14

To: Licensed Architects
Licensed Engineers
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Stephen Gogreve, Regional Manager of Fire & Safety/Health
Pat Day, Supervisor of Health Care Inspections
Plan Review

From: Jean Carter, Architect Supervisor
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Approved by: Mark F. Gates
Deputy Assistant Secretary/Chief Architect

Date: September 12, 2000

Re: Suspended Acoustical Ceilings Provided to Resist the Passage of Smoke

Several occupancy chapters of NFPA 101 Life Safety Code state the requirement that ceilings must be constructed to resist the passage of smoke. Suspended acoustical ceilings are typically not acceptable for this purpose as they are often loose fitting in their mounting tracks, susceptible to being broken or removed for maintenance purposes, and often are not replaced in a timely manner.

The commentary following NFPA 101:12-3.6.2 states that corridor walls need not be fire-rated but must be constructed to resist the passage of smoke. Where suspended ceilings are provided, partitions may be terminated at the suspended ceiling without any additional special protection if the suspended ceiling will resist the passage of smoke. The ability of the suspended ceiling to resist the passage of smoke must be carefully evaluated.

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This office is not aware of the existence of a nationally recognized standard to evaluate the ability of suspended acoustical ceilings to act as smoke barriers in case of fire. However, this office does have knowledge of an evaluation conducted by the National Bureau of Standards - NBS (now the National Institute of Standards and Technology - NIST) under the auspices of the Veterans Administration, Office of Construction Research, and the Department of Health and Human Services. The results of that evaluation were reported in February,1982, in a paper written by Mr. John H. Klote entitled, "Smoke Movement Through A Suspended Ceiling System" (NBSIR 81-2444). The evaluation consisted of a series of full-scale tests to determine smoke movement through a suspended acoustical ceiling system and into/from the interstitial space of a test assembly constructed to simulate the conditions of a hospital facility. A ceiling tile having a weight of 1 lb/sq ft was used. The test series consisted of one smoke candle and twelve fire tests including both smoldering and flaming fires. The effects of ventilation and smoke exhaust systems on smoke concentration in the test assembly were also investigated.

From the evaluation, it was concluded:

1. If properly installed, suspended ceilings will lessen the movement of smoke into the interstitial space from rooms affected by smoldering and flaming fires, and effectively reduce smoke downflow from the interstitial space into adjacent rooms not affected by fire.

2. If provided, interstitial space exhaust systems will effectively prevent hazard conditions caused by smoke downflow through suspended ceilings during low or high energy fires as represented in the test series.

3. Downflow leakage of smoke through the suspended ceiling is considerably less than leakage through open doorways, through cracks under doors and through the exhaust duct system.

4. In low energy fires and in the early stages of high energy fires, the most significant smoke leakage into the interstitial space occurs through the cracks between the wall and the wall molding of the suspended ceiling system, rather than through the suspended ceiling.

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The conclusions expressed by this evaluation were used by this office to formulate the following determination:

The Office of the State Fire Marshal will accept a suspended acoustical ceiling as a "ceiling design to resist the passage of smoke" subject to the following stipulations:

1. Weighted acoustical ceiling systems shall be provided such that the weight of the lay in ceiling panels is adequate to provide a tight, positive fit within the mounting track. A weighted material of 1 lb/sq. ft. minimum shall be acceptable; or,

2. There is provided wire hold-down clips or other approved devices installed above the ceiling panels to insure a tight fit in the mounting track; and,

3. The ceiling track/wall intersection shall be visually inspected by this office for verification as being tight fitting.

Also note that the entire ceiling of the facility adjoining those areas required to have smoke resistant ceilings is also be required to have smoke resistant ceilings. This ceiling continuity is required unless other building features are determined in this office to provide an equivalent level of safety as those features required by the code. Such factors which may contribute to this determination may be a combination of the following:

1. The affect of an interstitial space smoke exhaust system.

2. Timed egress studies will be considered when they indicate that smoke generated by a fire will not hinder a timely building evacuation.

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